# SYSTEMATIC NOTES ON SOME BETHYLIDAE FROM BOTSWANA: PRISTOCERINAE (HYMENOPTERA: ACULEATA) 

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Abstract.-Apenesia forchhammeri, new species, is described from both sexes from Botswana. Apenesia punctulata is proposed as a replacement name for A. punctata Kieffer, 1904, from Cameroon, preoccupied in Apenesia by Epyris punctatus Cameron, 1888. Males and the previously unknown females of Pristocera rhodesiae Turner, 1928, and Prosapenesia lacteipennis Kieffer, 1910, are described from Botswana.

Key Words: Hymenoptera, Bethylidae, Apenesia, Pristocera, Prosapenesia

Per Forchhammer, Serowe, Botswana, has operated several Malaise traps for the Smithsonian from 1986 to the present time. collecting all kinds of flying insects. The traps were placed in a vegetation type known as Acacia nigrescens/Combretum apiculatum tree savanna, at an altitude ca 1500 m , with an average annual rainfall ranging from 214 to 721 mm over a period of 10 years.

Forchhammer's collecting has yielded many interesting Hymenoptera, three of the more unusual of which are described below. All species of the bethylid subfamily Pristocerinac have small wingless females. Apterous female bethylids do not enter malaise traps by their own volition. The respective males are larger, fully winged forms with large multidentate mandibles that are well adapted to grasping the small female and carrying her during a mating flight. So it is, rarely of course, that one of these mating flights occasionally terminates in a trap.

The following abbreviations, mostly as used by Evans (1963), are employed in the descriptions that follow:

LH - length of head from middle of clypeal margin to midpoint of vertex:

WH-greatest width of head including cyes;

WF - width of front (i.e. least interocular distance);

HE-height of eye measured in lateral view;

EV-distance from top of eye to crest of vertex in lateral view;

WOT - width of ocellar triangle including posterior ocelli;

OOL-ocello-ocular line, least distance between posterior ocellus and inner eye margin:

LT-length of thorax, collar excluded, from anterior margin of pronotal disk to posterior end of propodeum;
propodeal formula (females only)-anterior width: narrowest width (usually at spiracles): greatest posterior width.

## Apenesia forchhammeri Krombein, <br> New Species

Figs. 1-13
Kieffer (1904, 1910b) deseribed six African species from females, none of which is similar to forchthammeri. Kieffer's species are either glossy and impunctate, or sparsely


Figs. 1-8. Female Apenesia forchhammeri Krombein, paratype. 1, Dorsum of head, $80 \times$; 2, head, lateral, $80 \times: 3$, eye, $535 \times: 4$, palpi, $870 \times ; 5$, mandible. $270 \times: 6$, terminal segment, maxillary palpus, $1140 \times: 7$, dorsum of thorax, $80 \times ; 8$, apex of propodeum and base of abdomen, $80 \times$


Figs. 9-13. Male Apenesia forchhammeri Krombein, paratype. 9, Dorsum of head, $35 \times$; 10 , mandible, $100 \times$; 11, dorsum of thorax, $35 \times 12$, propodeum and base of abdomen, $35 \times 13$, genitalia (a), and (b) sixth sternum and subgenital plate, dorsal aspect at left, ventral at right.
punctate and delicately alutaceous. The female of forchhammeri is quite densely punctate on the head, more moderately so on the thorax, and the integument of the head and thorax is strongly alutaceous.

Holotype female.-Length 2.7 mm , LH 0.6 mm , LT 0.9 mm . Head and thorax predominantly ferruginous, narrowly infuseated above coxae, apex of mandible dark, antenna light red except flagellum testaceous beneath, legs pale testaccous, abdominal petiole black, rest of abdomen light red except large infuseated bloteh on first tergum and narrow infuseated band at base of second and third terga. Vestiture pale, short, ereet and sparse.

Head (Figs. 1-2 of paratype) dull. strongly alutaceous, moderately densely punctate, many of punctures separated from each other by diameter of a puncture or less, LH $1.4 \times \mathrm{WH}$; labial palpi 2 -segmented, maxillary palpi 3 -segmented (Fig. 4), terminal segment of latter (Fig. 6) with apical seta $1.3 \times$ as long as segment; mandible (Fig. 5) quadridentate; clypeus narrow, apical margin truncate medially, midline strongly carinate; eye (Fig. 3) dark, ovate, small, with 5-6 facets; scape about three times as long as thick; flagellum about $2.7 \times$ as long as scape, slightly clavate toward apex.

Thoracic dorsum (Fig. 7) strongly alutaceous, more sparsely punctate than head; pronotal disk $1.3 \times$ as long as apical width; mesonotum narrower than pronotum, about $0.7 \times$ as long as wide: mesopleuron with moderately broad dorsal surface rounding abruptly to broad lateral surface; propodeum $1.75 \times$ as long as maximum width, minimum width $0.81 \times$ maximum width, propodeal formula 23:21:26; forefemur $2.6 \times$ as long as broad; mid tibia with weak spines. hind tibia with setac only.

Abdomen shining, not alutaceous; petiole (Fig. 8) composed of sternum only, stout and short, about $1.6 \times$ as wide as long.

Male.-Length 3.9-5.3 mm, forewing 2.63.7 mm . Body shining except propodeum rather dull from sculpturing; head black,
thorax black except pronotal collar sometimes light red, abdomen black, rarely brown, last two segments light red; antenna, mandible except apex, tegula, trochanters and tarsi light red, coxae black to dark brown, latter two pairs rarely light red, femora dark to light brown, occasionally reddish beneath, tibiae brown to light red. Wings elear, stigma dark brown, veins light brown to testaceous.

Head (Fig. 9) slightly longer than broad, WH 0.83-0.95 $\times \mathrm{LH}$; mandible (Fig. 10) robust, quinquedentate; clypeus with median apical margin broadly truncate, central carina rounded in profile, evanescent just before apical margin; WF $0.61-0.64 \times$ WH and $1.22-1.47 \times \mathrm{HE}$; front with relatively small, shallow, dimpled punctures separated from one another by $1.0-1.5 \times$ diameter of puncture; ocelli not enlarged, OOL 1.08-1.33× WOT, front angle about $90^{\circ}$; first four antennal segments in a ratio approximately 20:7:11:9, third segment $1.75-2.00 \times$ as long as wide, pubescence very short, suberect. glittering.

Thorax (Fig. 11); pronotal disk with strong anterior carina, posterior half shallowly depressed, surface sculpture variable, ranging from sparsely punctate, more densely so laterally on anterior half in smaller specimens to rather densely punctate on anterior half in largest specimens, depressed posterior half with eloser, small punctures except apical rim; notauli and parapsidal lines well developed, surface of seutum variably punetate, relatively sparsely so in smaller specimens and more densely in larger: scutellum anteriorly with transverse groove, with sparse punctures concentrated along anterior groove and lateral margins of central raised disk; metanotum with a small, shallow setose pit in middle, areas laterad of this divided into a series of deeper, larger foveae separated by longitudinal carinae: propodeal disk $0.94 \times$ as long as wide. rounding apically into posterior surface (Fig. 12), posterior carina lacking, lateral carina weak, basal triangle irregularly rugose, areas
laterad of triangle irregularly rugulose; posterior surface almost smooth in smallest specimens, finely, closely, arcuately carinulate in larger specimens; tarsal claws bidentate apically, without an additional basal tooth; forewing with costa extending beyond stigma about $0.6 \times$ length of stigma.

Abdomen with short petiole (Fig. 12) composed of both tergum and sternum; subgenital plate and sixth sternum (Fig. 13b), the former deeply and narrowly divided almost to base, very broad, lateral third weakly sclerotized and doubled over to form a pocket opening anteriorly on ventral surface, sixth sternum with apical margin broadly, shallowly emarginate; genitalia (Fig. 13a) with aedeagus moderately stout, the parts closely consolidated.

Variation. - The two female paratypes are 2.5 and 2.6 mm long, and are very similar to the holotype in all details. One topotypic male, collected Dec 1987, is not included in the type series. Its measurements fall within the ratios listed above. and it agrees with other males in essential details of punctation, genitalia and subgenital plate, but the antennae and last two abdominal segments are testacous, the mandibles and tarsi are ivory, and the wing venation is white.

Type series.-Holotype: ㅇ, BOTSWANA, Serowe, Farmer’s Brigade, malaise trap. Dec 1987, Per Forchhammer. Paratypes: 3 \&, 18 o, same label data except Feb (2 $\delta$ ), Dec ( $(\%)$ 1986, and Jan ( $\delta$ ), May ( $\delta$ ), Jul ( $\delta$ ), Oct ( $(0$,
 A pair of paratypes will be deposited in the British Museum (Natural History).

Etymology. - The species is named for Per Forchhammer who has greatly enriched the national collection by his collecting in Botswana.

## Apenesia punctulata Krombein, New Name

Apenesia punctata Kieffer, 1904: 366 (\%; "Afrique occ., Mt. Camerun, 800-1 200 m ;" unique holotype in Genoa). - Kieffer, 1908: 25 (listcd).-Kieffer, 1914: 393 (redescribed in German). Preoccupied by

Epyris punctatus Cameron (1888: 174175), transferred to Apenesia by Evans (1963: 280).
Remarks. - The coloration of punctulata is somewhat similar to that of forchhammeri, but the mandibles are bidentate in females of the former species rather than quadridentate, the pronotum is twice as long as the mesonotum rather than thrice, and the head and thorax are smooth and sparsely punctate rather than strongly alutaceous and rather densely punctate.

Etymology. - The name is the Latin diminutive of purctata.

## Pristocera rhodesiae Turner <br> Figs. 14-21

Pristocera oriphila rhodesiae Turner, 1928: 142 ( $\delta$ : Sawmills, Southern Rhodesia; holotype now in South African Museum, Capetown).
Pristocera rhodesiae Turner, Benoit, 1963: 50-51, fig. 81 (holotype redescribed).
Female.-Length 4.9 mm , LH 0.85 mm , LT 1.40 mm , abdomen almost $4 \times$ its greatest width. Body entirely light red, except mandible with teeth and outer and inner margins castancous, eye black.

Head shining, not at all alutaceous, in dorsal (Fig. 14) and lateral (Fig. 15) views; mandible (Fig. 17) with three teeth; labial palpi 3 -segmented, maxillary palpi 6 -segmented; clypeus with median carina not arched, ending in a small, rounded median projection on apical margin on cither side of which the margin has a weak rounded lobe with two tiny, short, rounded projections; LH $1.32 \times$ WH, sides narrowing very slightly nearly to posterior margin where they converge more strongly to straight vertex, punctures on front small and shallow, quite sparse medially but more crowded anteriorly and laterally; eye (e. Fig. 15) small, rounded, slightly longer than high, with about eight facets, covered by a flat lens; antenna thickening gradually toward apex, segment 11 about $0.75 \times$ as long as wide.

Thorax shining, not at all alutaceous, in


Figs. 14-17. Female Pristocera rhodesiae Turner. 14, Dorsum of head, $55 \times$; 15, head, tateral (e e eye), $55 \times$; 16, dorsum of thorax, $55 \times$ : 17 , mandible, $135 \times$.
dorsal view (Fig. 16); pronotal disk abruptly declivous to collar, $2.13 \times$ as long as wide. with very sparse, shallow, small punctures; mesonotum $0.75 \times$ as long as wide, with a few small lateral punctures; propodeum $2.44 \times$ as long as maximum width, $12.2 \times$ as long as minimum width, with a few small punctures near lateral margin beyond constriction, propodeal formula $20: 5: 25$; forefemur flattened, $2.18 \times$ as long as wide; mid tibia with about 20 moderately stout spines.
Abdomen not petiolate, shining, with sparse, subrecumbent setae laterally and
apically on the segments, terga $1-5$ also with very tiny micropunctures separated from each other by several times diameter of puncture.

Male. - Length 5.1-7.5 mm, forewing 3.55.0 mm . Black and shining; mandible ivory to light red, except outer and inner margins and teeth dark red; tegula and basal segments of legs dark brown; seventh abdominal segment and occasionally apex of sixth. tibiae and tarsi light red. Wings subhyaline, reins light brown, stigma dark brown. Vestiture pale, glittering, suberect and moder-


Figs. 18-21. Male Pristocera rhodesiae Turner. 18, Dorsum of head, $30 \times$; 19, mandible, $50 \times ; 20$, dorsum of thorax, $30 \times ; 21$, genitalia (a), and (b) sixth sternum and subgenital plate, dorsal aspect at left, ventral at right.
ate on head and thorax, decumbent and sparse on sides and apices of abdominal segments; eyes bare.

Head (Fig. 18) about as wide as long, WH $0.98-1.07 \times$ LH; mandible (Fig. 19) robust, quinquedentate; clypeus with median carina moderately arched in profile, apical margin broadly rounded; WF $1.59-1.67 \times \mathrm{HE}$ and $0.63-0.67 \times \mathrm{WH}$; front with relatively small, dimpled punctures that are somewhat sparser in smaller specimens; ocelli not enlarged, OOL $0.70-1.00 \times$ WOT, front angle about $90^{\circ}$; first four antennal segments in a ratio ranging from 13:3:7:7 to 17:4:11: 9 , third segment $1.58-2.00 \times$ as long as wide.

Thoracic dorsum (Fig. 20); pronotal disk transversely carinate anteriorly, posterior third depressed, anterior part with shallow dimpled punctures that are denser toward side; scutum with larger shallow punctures that are denser on area between notauli and parapsidal lines; scutellum anteriorly with transverse groove, disk with small scattered punctures; metanotum with a small median pit anteriorly, area behind pit with fine, dense piliferous punctures. laterad of pit a larger fovea; propodeal disk about $0.8 \times$ as long as wide, rounding apically into posterior surface, medially with a weak carina reaching almost to apex, basally without a well-defined triangular area, diseal surface with moderately close, irregular, transverse rugulae that are sparser in smaller specimens, lateral carina weak; posterior propodeal surface lacking median carina, with fine, close, transverse, arcuate rugulae that are sparse or evanescent in smaller specimens; tarsal claw bidentate at apex, inner tooth subparallel to outer, but much shorter and truncate apically, base of claw with small tooth; costa of forewing not extending beyond stigma.

Abdomen not petiolate; subgenital plate and sixth sternum (Fig. 21b), the former deeply and narrowly divided almost to base. lobes broadly rounded at apex. sixth sternum with a weak rounded median lobe on apical margin; genitalia (Fig. 21a) with ae-
deagus relatively slender, the parts closely consolidated.

Specimens examined. - \& 10 of, BOTSWANA, Serowe, Farmer's Brigade, malaise trap, Per Forchinammer, Sep (i. 5 z) and Nov ( 8 ) 1986, Jan (3 8) and Dec 1987 ( ${ }^{1}$ ).

## Prosapenesia Kieffer, 1910

Benoit (1981) established the tribe Usakosiini for Prosapenesia. Usakosia Kieffer, 1914, and Neusakosia Benoit, 1981. The tribe was based essentially on the conformation of the seventh abdominal sternum (subgenital plate) of the male (Fig. 29b), which has the subtriangular section between the apical lateral lobes angled abruptly upward, i.e. toward the seventh tergum, as contrasted to the broadly and slightly convex surface of that sclerite in other Pristocerinae.

The fortuitous circumstance of a wingless female being carried into a Malaise trap during her mating flight provides an opportunity to describe the female of Prosapenesia. It shares many characters including aptery with the relatively few known pristocerine females. The eyes are entirely lacking, whereas other pristocerine females have several to many well differentiated facets. Evans noted (1964: 63) that the eyes of Pseudisobrachium are reduced to a single facet that is sometimes indistinct. The only other differentiating character of female Prosapenesia is that the median clypeal carina terminates at a narrow, truncate, thickened apical lobe (see L, Fig. 22). These two characters are too trivial to justify retention of the tribe Usakosiini.

## Prosapenesia lacteipennis Kieffer

Figs. 22-29
Prosapenesia lacteipennis Kieffer. 1910a: 43 ( $\delta$; Namibia; unique holotype in Ber-lin).-Kieffer, 1914: 424 (ô; redescribed). - Benoit, 1981: 835-836, figs. I a-c ( $\delta$; Namibia; redescribed).
Female.-Length 3.0 mm , LH 0.6 mm .


Figs. 22-24. Female Prosapenesia lactetpennis Kieffer. 22. Frontal aspect of head ( $\mathbf{L}=$ clypeal iobe), $220 \times$; 23, dorsum of head, $100 \times ; 24$, dorsum of thorax, $100 \times$.

LT 1.2 mm . Head, mesopleuron and extreme base of abdomen very dark brown; dorsum of thorax and prosternum beneath medium brown; sides of pronotum and prosternum ferruginous; mandible except apex, clypeus, antennae, legs and abdomen light red. Vestiture pale, erect to suberect, sparse and short.

Head (Fig. 23) slightly longer than wide, WH $0.95 \times$ LH, moderately alutaccous, rather shiny, with small punctures most of which are separated from each other by $2-$ 3 times diameter of a puncture; mandible (Fig. 22) bidentate, lower tooth more acute and longer; clypeus narrow, with median longitudinal carina that is straight in profile and terminates at a narrow, truncate, thickened apical lobe (L, Fig. 22), lower margin of truncation slightly and shallowly emarginate; eyes completely lacking; antenna 13 segmented, scape relatively slender, $4.2 \times$ as long as wide, flagellum $2.3 \times$ as long as scape, not enlarged toward apex, segments $6-10$ equally wide and $0.82 \times$ as long as wide.

Thoracic dorsum (Fig. 24) moderately alutaccous, punctures smaller and sparser than on head; pronotal disk slightly longer than apical width, not carinate anteriorly, abruptly declivous to collar: mesonotum at base narrower than pronotum, sides converging strongly toward apex, $1.16 \times$ as long as basal width; mesopleuron with large dorsal area rounding gradually to lateral surface; propodeum more delicately alutaceous, $1.95 \times$ as long as greatest width, minimum width $0.35 \times$ maximum width, propodeal formula 9:7:20; forefemur rather slender, $3.0 \times$ as long as wide: mid tibia strongly spinose, hind tibia with setae only.

Abdomen not petiolate, shiny not alutaceous, about $2.6 \times$ as long as wide.

Male. - Length 3.7-6.5 mm, forewing 2.54.4 mm . Smallest specimens with integument mostly dark brown except legs lighter brown, mandible except teeth and upper and lower margins and clypeus light red; largest specimens with integument predominantly light red except apex and margins of man-
dible and extreme base of abdomen dark brown, scutum, metanotum, propodeum, mesosternum and lateral blotches on middle of second to seventh abdominal segments light reddish brown. Wings with a slight milky cast, stigma dark to light brown, veins light brown to testaceous. Vestiture sparse, pale, short, suberect.

Head (Fig. 25) slightly broader than long, WH 1.12-1.17× LH, posterior margin straight in smaller specimens, angularly indented in larger specimens, front in middle with bilobed process projecting above and between antennal insertions, weakly to strongly grooved along midline nearly to anterior ocellus; mandible (Fig. 26) robust, quinquedentate; elypeus narrow, apical margin broadly and shallowly arehed inward on median third, surface slightly concave; WF 1.54-2.13× HE and 0.61-0.66× WH, with small, scattered punctures that are quite shallow in smaller specimens, becoming denser and deeper in larger speeimens; eye slightly protuberant, EV 1.23$1.79 \times \mathrm{HE}$, ocular setae lacking; ocelli not enlarged, placed well forward on head, OOL $0.70-0.86 \times$ WOT, front angle of triangle about $110^{\circ}$, first four antennal segments in a ratio ranging from 18:6:8:9 to 36:9:19:19, third antennal segment $1.50-2.38 \times$ as long as wide; pubescence very short, dense and erect.

Thorax (Figs. 27, 28); pronotal disk abruptly declivous to collar, anteriorly with transverse, erect lamella that is narrowed toward middle, disk with seattered fine punctures, posterior half depressed; scutum with fine scattered punctures, notauli and parapsidal lines well developed; scutellum with anterior transverse groove and a few fine punctures; metanotum with small, shallow pit in middle, laterally with small foveac; propodeal dorsum rounding into posterior and lateral surfaces, median and lateral carinae weak, anteriorly usually with weak, close, longitudinal rugulae beyond which surface with close transverse rugulae: posterior surface with close arcuate rugulae; lat-


Figs. 25-29. Male Prosapenesia lacteipennis Kieffer. 25. Dorsum of head, $40 \times$; 26, mandible, $85 \times$ : 27, dorsum of thorax, $40 \times: 28$, lateral aspect of thorax, $40 \times: 29$, genitalia (a), and subgenital plate (b), dorsal aspect at left. ventral at right.
eral surface with more separated, sinuous rugulae.

Abdomen not petiolate; seventh tergum broadly rounded at apex: subgenital plate (Fig. 29b) bilobate at apex, subtriangular section between lobes folded inward toward tergum; genitalia (Fig. 29a) with aedeagus massive, parts closely consolidated, paramere subtruncate to slightly rounded at apex, deeply concave ventrally in middle for reception of digitus and apex of cuspis.

Variation. - The forewing length is a more reliable measure of size than total body lengit owing to the variable degree of telescoping of the posterior abdominal segments. When the series of lacteipennis males is arranged in order of increasing forewing length, two significant differences are apparent. The smaller specimens, 3.3 mm or less in forewing length, include the darkest specimens, and the larger, 3.4 mm or longer, have gradually increasing amounts of light reddish brown to red integument.

The shape of the head also changes with increasing size. The posterior margin of the head is straight in the smallest specimens and the median, bilobate frontal process above and between the antennal insertions projects rather weakly. At about 3.0 mm forewing length the posterior margin of the head becomes angularly indented in the middle and the frontal process projects more strongly (Fig. 25), both of these characters becoming more accentuated with increasing size.

Specimens examined. -9, 19 8, BOTSWANA, Serowe, Farmer`s Brigade, malaise trap. Per Forchhammer, Sep ( $\delta$ ) and Nov ( 8,10 o) 1986, Jan ( $\delta$ ), Feb (2 ô), Apr (4 $\delta$ ) and Nov ( $\delta$ ) 1987.

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## Literature Cited

Benoit, P. L. G. 1963. Monographie des Bethylıdae d'Afrique Noire (Hymenoptera). 1, Sous-famille Pristocerinac: Tribu Dicrogeniini; Tribu Pristocerini, Gen. Pristocera Klug. Ann. Mus. Roy. Afr. Centr., Sci. 119: 1-95.
——. 1981. Bethylidae africains (Hymenoptera). La Tribu Usakosiini. Rev. Zool. Afr. 95: 833-842.
Cameron, P. 1888. Descriptions of twenty-three new species of Hymenoptera. Mem. Manch. Lit. \& Phil. Soc. (4) 1: 159-183.
Evans, H. E. 1963. A revision of the genus Alenesia in the Americas (Hymenoptera, Bethylidac). Bull. Mus. Compar. Zool. 130: 249-359.

- 1964. A synopsis of the American Bethylidae (Hymenoptera, Aculeata). Bull. Mus. Compar. Zool. 132: 1-222.
Kieffer, J.-J. 1904. Description de nouveaux Dryininae et Bethylinae du Musée de Gênes. Ann. Mus. Civ. Stor. Nat. Genova 41: 351-412.
- 1908. Hymenoptera. Family Bethylidae. Genera Insectorum 76: 1-50.

1910a. Description de nouveaux Béthylıdes (Hymén.). Ann. Soc. Ent. France. 79: 31-56.

1910b. Serphidac, Cynipidae, Chalcididae, Evaniidae und Stephanidae aus Äquatorialafrika. Wiss. Ergeb. Deut. Zent.-Afr.-Exped. 1907-1908. 3, Zool. 1: 91-119.
1914. Bethylidae. Das Tierreich. 41: 1-595.

Turner, R. E. 1928. New Hymenoplera of the Family Bethylidac. Ann. \& Mag. Nat. Hist. (10) 1: 129152.

